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ANTERIOR SPINAL PARALYSIS

WITH FORMATION OF VACUOLES IN THE GANGLION
CELLS OF THE SPINAL CORD.

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BY

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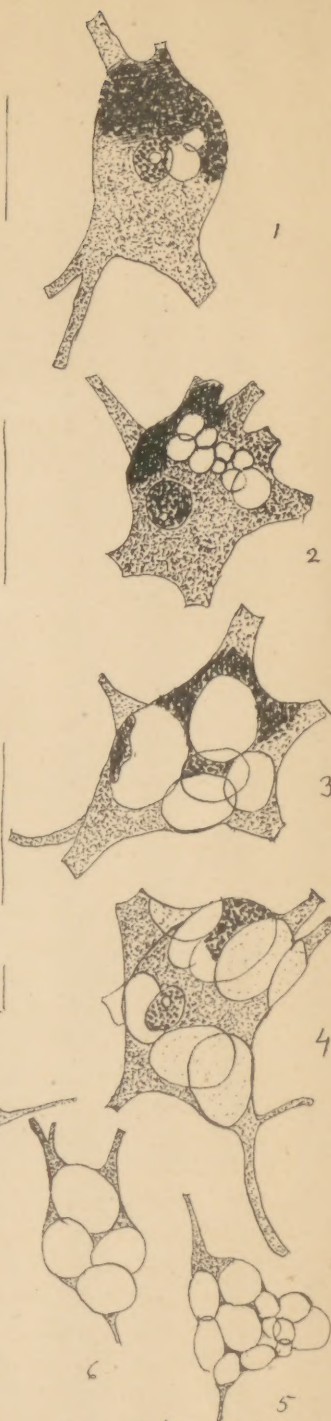
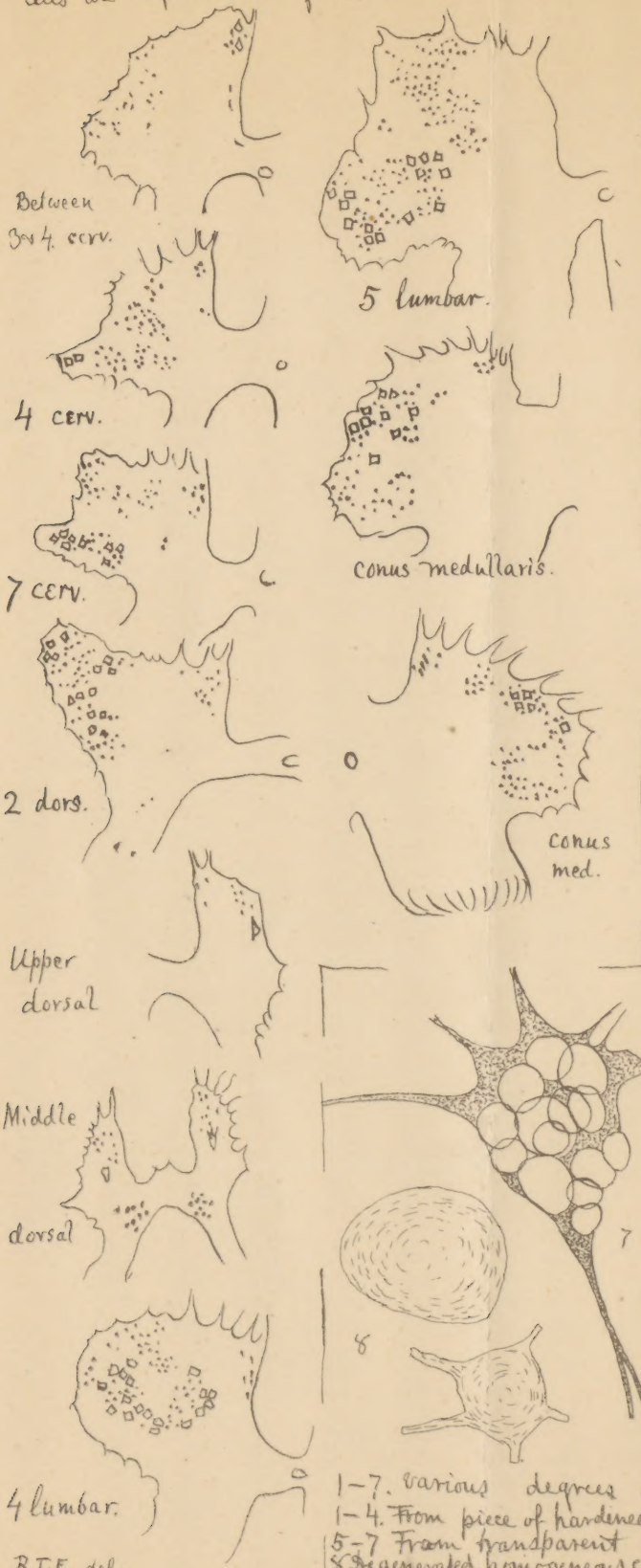


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The open outlines & mean vacuole cells. The other cells are represented by dots.



Ganglion cells
from anterior horns
of spinal cord. X ca 300

1-7. Various degrees of formation of vacuoles.
1-4. From piece of hardened cord picked out in glycerine.
5-7. From transparent sections.
8. Degenerated homogeneous cells with atrophy of processes.



A CASE OF ANTERIOR SPINAL PARALYSIS

WITH FORMATION OF VACUOLES IN THE GANGLION CELLS OF THE SPINAL CORD.¹

BY ROBERT T. EDES, M. D.

MARY M., aged twenty-six, born in Ireland, living in Boston, housewife, entered the Boston City Hospital March 13, 1879.

March 13th. Perfectly well until four weeks ago, when she vomited steadily for four days. Was costive for two weeks. One week from beginning of illness began to suffer from pain on inner aspect of both legs, appearing first in the feet, shooting as far as ankles, then to the knees, and finally up the thighs. A few days later she began to lose power in both legs, and sensation below the knee became impaired. After the loss of power was noticeable, numbness and prickling feelings were felt in legs. Two or three days ago hand began to feel numb, and its strength impaired. Has vomited occasionally during last three weeks. Cannot now stand, and suffers greatly from pain. No vesical trouble. Bowels constipated. No sensation of constricting band above umbilicus. Vomiting came on about twelve, and she complained of pain, which was relieved by morphia.

March 14th to 19th. There is but little power of voluntary motion in legs. Can move her fingers, but cannot grasp a pen well enough to write. The muscles of the calf are much wasted. Muscles above knee react to faradic current, but much less than normally. Hardly any reaction below knee. The strongest current of Fleming and Talbot's battery hardly produced contraction of muscles. Tendon reflex absent. Ordinary sensibility somewhat diminished, but no complete anæsthesia of legs. Numbness in hands, but not in arms. Complains of pain at lower part of thorax, from line of nipple on right to somewhat behind the corresponding point on the other side. Pulse rapid and feeble; temperature a little raised, only once or twice above 100° F., and much of the time below 99° F. Cups to the back, and morphia *pro re nata*. Urine dark, 1035, acid; sugar and albumen absent; sediment, blood, pus, bladder epithelium, fusiform cells, one or two granular casts(?), uric acid. March 21st. Did not sleep, delirious all night, some delirium

¹ Read before the American Neurological Association, New York, June 19, 1879.

this morning. P. M. Was very noisy. Hallucinations during early part of night were marked. March 24th. For two days there have been involuntary and unconscious discharges from bowels and bladder.

April 1st. Mouth drawn a little to left, and a slight twitching of a little muscular slip below septum narium. April 5th. Delirious. Complains of pain in her chest, which she attributes to being run over by the cars.

From this time her condition remained nearly the same. She lay partly conscious and stupid, with occasional screaming or crying. She could move her feet, but only by swinging them from the thigh and by the thigh muscles. She could move her hands somewhat in the same way, constantly drawing them up, as if to pull the bed-clothes, which, however, she was entirely unable to grasp. The symmetrical atrophy of both legs below the knees and of both arms below the elbows was very striking. The treatment consisted of chloral or bromide, with as much food as she could be got to take. Refuses food. Involuntary dejections. Some drawing of face to left. Left pupil larger than right, but both react to light. April 23d. Died.

At the autopsy, made by Dr. Cutler, beyond some not remarkable staining and congestion, nothing special was found in the thorax and abdomen. The uterus bore the marks of a former pregnancy. In the brain the puncta vasculosa were normally distinct; vessels not abnormal. Nothing remarkable found in the cortex or great ganglia. The spinal cord was perhaps a little less injected proportionally than the brain and the rest of the body. The distinction between the gray and white matter at the cervical enlargement was thought to be a little less marked than elsewhere.

After the cord had been placed in alcohol with iodine for a few days, then in chromic-acid solution, and again in alcohol, sections were prepared in the usual manner. Portions of the anterior horns were also picked out in glycerine.

The white substance of the cord appears normal in every respect, there being no increase of neuroglia,¹ and no atrophy or swelling of the nerve fibres.

The gray substance retains its normal conformation and symmetry. Its connective tissue, so far as can be seen in sections, and upon careful examination of portions picked out in glycerine, is unchanged.

The vessels in most of the sections presented no alteration, but here and there one could be found which appeared to have an unusual number of nuclei in its sheath. In one section, from the cervical region, where a piece of artery of this kind was seen in the anterior horn, an

¹ My friend, Dr. J. C. Shaw, of Brooklyn, thought that he detected the presence of sclerosis in the lateral columns. A careful examination of a new set of sections has failed to convince me of its existence.

oval clump of small cells, highly colored by carmine, was present in the "neck" of the posterior cornu. These were the only appearances which pointed toward any proliferative process.

The principal alteration to be found was in the large cells of the anterior cornua, which presented a very striking and obvious lesion to an examination even with low powers.

Large numbers of these cells were marked by the formation of *vacuoles*, round, oval, or, in case of pressure, somewhat polygonal spaces, appearing transparent, clear, and uncolored. These cavities were present in varying numbers, from one or two small ones, situated near the periphery of the cell, up to a dozen or more, transforming the cell into a swollen, honey-combed structure, in which the protoplasm formed but a scanty frame-work supporting the vacuoles. The nucleus was sometimes present and normal in appearance, even when a large part of the cell was transformed into the vacuoles; but in other cases seemed to be pushed to one side and compressed, or altogether wanting. The processes were comparatively little changed, but a careful examination showed that especially in those cells where the alteration was most advanced they were smaller, and could not be traced so far into the surrounding structure. The pigment was but little altered, and the general appearance of the protoplasm, where it remained, was not markedly different from the normal.

Beside these "dropsy-cells" (I use the word merely for the sake of brevity, and not as having any pathological significance), there were to be found a few which were altered in another way, being rounded, the processes shrunken or indistinguishable, the nucleus invisible, and contents pale and homogeneous. These were much less numerous than the others, and not to be found in all sections. None of the shrunken and atrophied cells often found in cases of various forms of myelitis were to be found, and if any had undergone the "vitreous" change often observed I was unable to recognize it. I saw no vacuoles in any nucleus, nor any other change than the compression already described.

The distribution of these "dropsy-cells" forms an interesting and suggestive study. It can be easily seen in the accompanying sketches, the outline of the gray substance and the position of the degenerated cells being determined by the camera lucida.¹ The abundance of the "dropsy-cells" is, if at all erroneous, rather understated. The lesion, so far as could be seen, was confined to the cervical enlargement, with some traces in the upper dorsal region, and to the lumbar enlargement. In these regions, again, it affected a special portion of the gray substance, namely, the outer group of cells, and, in the cervical enlargement, those lying externally and posteriorly. The little group occu-

¹ In most of the figures only *one* horn is represented, the distribution of the diseased cells being exceedingly symmetrical.

pying the anterior inner angle of the anterior horn was in only one instance, and to the extent of two cells, affected, and in the cervical region the group next to it remained free.

As the lesion begins to appear in descending the cord, we first find two cells in the little antero-internal group, which from this point down afterward remains entirely free. Then we find two or three cells in the outer angle; then more of them along the middle and posterior portion of the anterior horn. In the upper dorsal region, in a few sections, a single degenerated cell may be found in the middle or external portion of the horn. In the lumbar region, so far as the more rounded form of the gray matter permits the distinction of the various groups, a similar distribution was observed.

The posterior vesicular columns of Clarke were not affected.

In the posterior horns I was unable to find any change of the few cells occupying that region.

The muscles below the knee, which were the only ones examined, exhibited the usual granulo-fatty degeneration in various stages.

I will not fatigue the association by referring to all or many of the cases in which a similar lesion has been observed. Suffice it to say that vacuoles have occasionally been seen by various observers in the ganglion cells, both of the spinal cord and the cerebral cortex, and that they have been supposed to have some pathological significance. Thus Mierzejewski represents some small ones in the brain of a general paralytic.¹ Leyden figures and describes them in his work on spinal diseases, and Gower and Sankey² speak of vacuoles "partly outside the cells" as being found in the spinal cord in cases of "canine chorea."³ A case, however, a report of which I saw for the first time after my own had been described and figured, has been recently published, in which, as in the present one, this seems to have been the most marked lesion of the spinal cord found; and the authors consider it worthy of a detailed description both clinically and pathologically. It is reported by Kahler and Pick.⁴ Clinically it belongs to the group of anterior spinal paralyses, and agrees closely with the "subacute general anterior spinal paralysis" of Duchenne, except in the supposed absence of the atrophy of certain muscular groups *en masse*, a feature the authors think may, after all, have been present, though masked by the development of fat.

In the account of the examination of the spinal cord it appears that only the lower part of the cervical enlargement was examined, and the distribution of the altered cells, as regards the various groups, is not mentioned. They say expressly that the white matter was normal, and

¹ Arch. de Physiologie, Deuxième Série, Tome ii., Pl. vi.

² Med.-Chirurg. Trans., 1877, vol. lx. p. 234.

³ At a subsequent session, Dr. Seguin exhibited sections from a case of ordinary transverse myelitis, in which some of the cells contained a few vacuoles.

⁴ Vierteljahrsschrift für Praktische Heilkunde, Bd. cxlii. p. 5.

the connective tissue not increased. All the cells are said to have had a faded, dull outline, and many of them to have contained the vacuoles shown in their plate.

This case, together with my own, would go far to show that a parenchymatous change may take place independently of a lesion, or with a very slightly developed alteration of the connective tissue or blood-vessels.

The case of Dr. Webber, published in the first volume of the transactions of this society, as well as that of Cornil and Lepine, shows clearly enough that changes of an inflammatory character are *likely* to be present, and may be one of the causes of degeneration; but it is also probable that they are not *necessary* to a complete development of symptoms of great or fatal severity, and that the parenchymatous lesion, whether we call it inflammatory or degenerative, is of primary importance. It seems to me, therefore, that the name given by Duchenne, "subacute general anterior spinal paralysis," is really a more comprehensive one than the more modern "polio-myelitis, or "tephro-myelitis," since the question of inflammation, implied by this terminology, is precisely that about which doubt still hangs.

